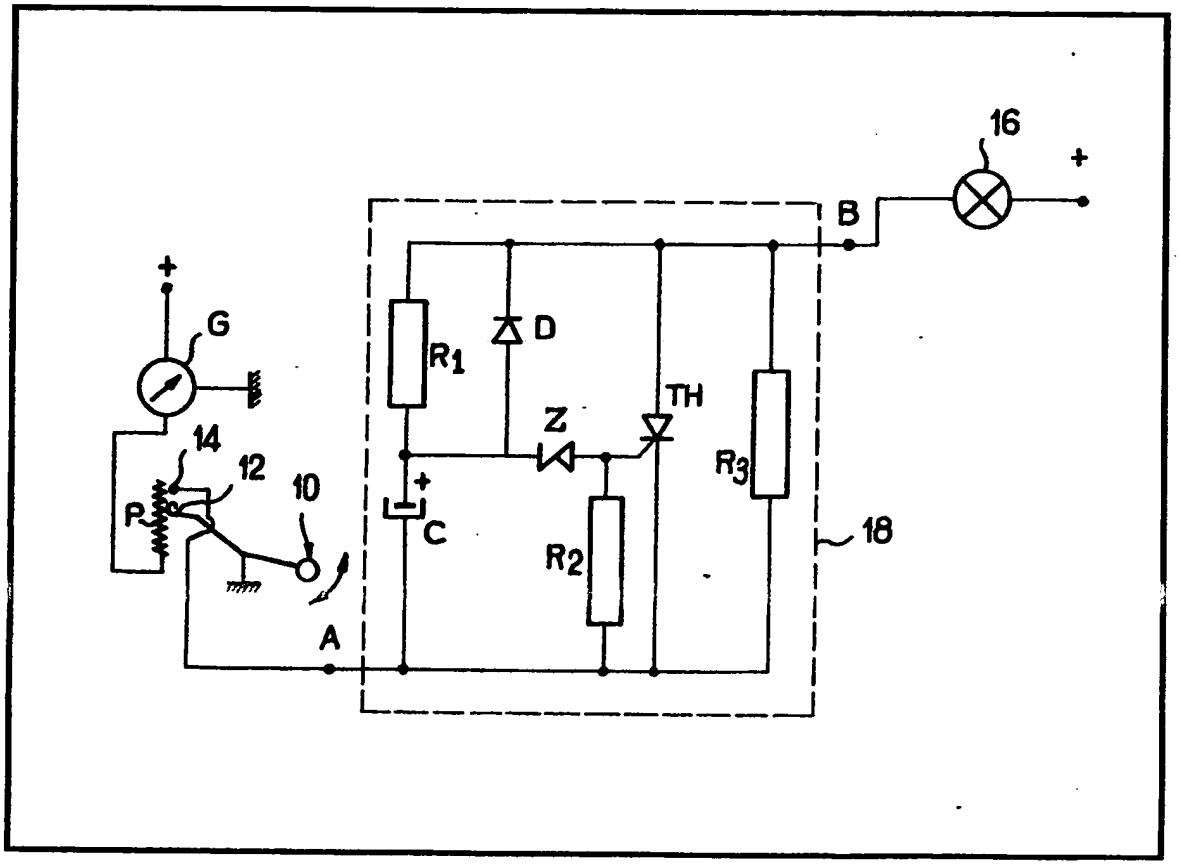
(12) UK Patent Application (19) GB (11) 2 047 495 A

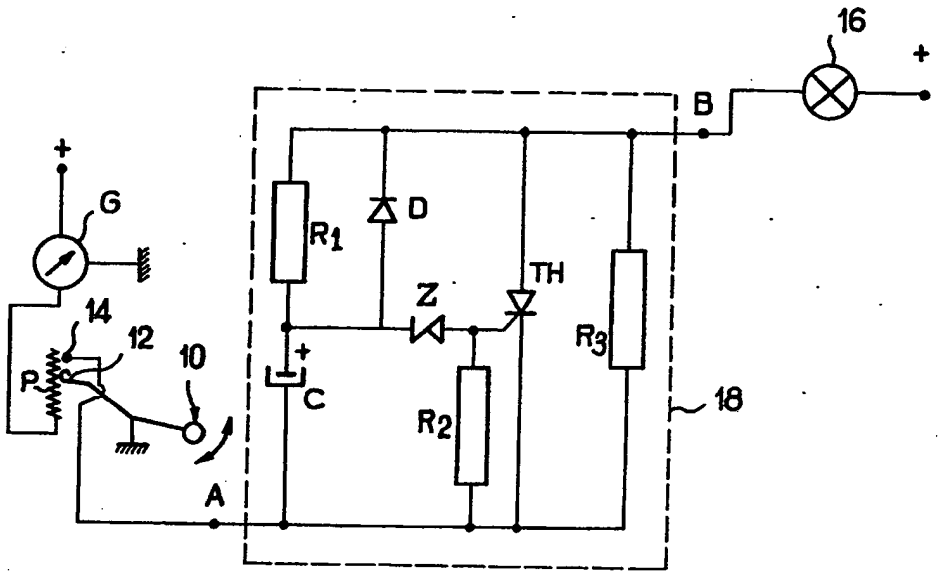
(21) Application No 8007607
(22) Date of filing
6 Mar 1980
(30) Priority data
(31) 7906962
(32) 20 Mar 1979
(33) France (FR)
(43) Application published
26 Nov 1980
(51) INT CL³ H03K 17/28
(52) Domestic classification
H3T 2E 2T2Z 2T3TX 3D
3F1 CD
(56) Documents cited
GB 1435086
GB 1342444
GB 1303827
"SCR Manual—Fifth Edition—General Electric" Pub 1972 by General Electric Co USA See Example p93 Fig 422 p114 Fig 443
"RCA Solid-State Databook—Thryristops Rectifiers and Dials SSD-206A" 1973 Ed See Example p370 Fig 4 p371 Fig 5
(58) Field of search
H3T
(71) Applicant
Jaeger
2 rue Baudin
92 Levallois-Perret
France
(72) Inventor
Sylvain Joseph
Lumbroso
(74) Agents
Marks & Clerk

(54) Delayed-action warning control circuit

(57) The invention relates to a delayed-action warning control circuit, in particular of a type intended to be connected in series with a warning device such as a warning light and a contact for detecting a threshold level of a liquid, such as a fuel. The control circuit has two terminals between which are connected a capacitor in series with a resistor. Control means monitor the voltage across the capacitor and short-circuit said terminals if the monitored voltage exceeds a predetermined value.



GB 2 047 495 A


16
+
B
+
G
R1
D
TH
Z
R3
14
12
10
P
C
R2
18
A

SPECIFICATION

Delayed-action warning control circuit

The present invention relates to a delayed-action warning control circuit for use in a device for detecting when an upper or lower threshold of a level of liquid is exceeded. More particularly the device is applicable to the detection of a threshold of the level of fuel in a vehicle where on the one hand it is important that the driver of the vehicle recieves a warning signal when the level of fuel in his tank reaches a minimum threshold and where on the other hand particular conditons due to the fact that the tank is located in a moving vehicle require that one takes into account movements of the liquid in the tank, in particular when the vehicle is cornering.

In fact, if happens that during cornering, there is a risk that the fuel in the tank may be shifted so that it actuates the lower threshold detector whereas the actual level of liquid in the stable position would not allow this actuation.

Devices have already been proposed for delaying the instant at which the warning signal is emitted, in relation to the instant of detection of a lower threshold of the liquid level. The warning signal is not emitted if the detector ceases to indicate an excessively low liquid level before the end of the time lag.

For example, delayed-action systems have been proposed using a thermistor having a negative temperature coefficient, but this device, although very simple, is not reliable particularly at low temperatures. The duration of the time lag depends essentially on the temperature and at very low temperatures there is a danger of the warning device being completely inhibited owing to the fact that the thermistor is in series with a warning light.

It is an object of the present invention to obviate or mitigate these drawbacks.

According to the present invention there is provided a delayed-action warning control circuit, in particular of a type intended to be connected in series with a warning device and a contact for detecting a threshold level of a liquid, characterised in that the control type circuit comprises a capacitor connected in series with a resistor between two terminals, and control means responsive to the voltage across the capacitor to short circuit the said terminals in the event of the said voltage exceeding a predetermined value.

Very advantageously, a discharge path is provided for the capacitor, such that the capacitor discharges at a rate which is faster than the rate at which the capacitor is charged through said resistor.

In a preferred embodiment, the discharge path comprises a diode connected in parallel with the resistor and a further resistor which is of a lower ohmic value than said resistor, the further resistor being connected between said terminals.

According to another feature of the invention, the control means comprise a thyristor connected between said terminals.

Preferably, the control means also comprise a Zener diode connected between the common point of the capacitor and said resistor and the gate of the thyristor.

Advantageously, in practice, a resistor is provided between the gate of the thyristor and one of said terminals of the circuit.

Further features and advantages of the invention will become apparent on reading the detailed description given with reference to the single figure which illustrates a delayed-action warning circuit according to the invention.

The drawing shows the circuit of a fuel level gauge and a device for detecting when a lower fuel level is reached. The circuit comprises a resistive detector, constructed in a conventional manner, comprising a float 10 which moves when the level of liquid varies and as it moves it actuates a contact 12 which constitutes the slide of a potentiometer P. This slide 12 is connected to the electrical earth of the system, whereas one end of the potentiometer P is connected in series with a galvanometer G and one terminal of a source of d.c. voltage (vehicle battery), and the other terminal is connected to earth. The galvanometer G indicates the current passing therethrough, which current is a direct function of the position of the slide 12 along the potentiometer P, and thus of the level of liquid.

The threshold detector (in this case a minimum threshold which is acceptable for the fuel in its tank) is constituted by an electrical contact 14 against which the slide 12 of the potentiometer may press when the level of liquid corresponds to the minimum threshold.

The contact 14 is connected, through the delayed-action circuit according to the invention, to a warning light 16 which is itself in series with a source of d.c. voltage, for example the voltage of the vehicle battery taken after the contact key.

When the level of liquid is above the threshold, the contact 14 is not actuated and does not allow any current to flow through the lead which connects it to the warning light 16. The light 16 is thus not illuminated. When the level of liquid reaches the minimum threshold, the slide 12 which is connected to the electrical earth of the system connects the contact 14 to this earth, allowing the flow of current to the light 16, if the time lag circuit connected in series between the contact 14 and the light 16 allows the passage of a sufficient current to illuminate the warning light.

The time lag circuit is shown inside a frame drawn in broken line and designated by the reference numeral 18 in the drawing. As will

be seen, it is simply connected in series in a conductor which extends between the contact 14 for detecting the threshold and the warning light 16 on the vehicle dashboard. No additional conductor is necessary to allow the installation of this delayed-action device in a warning circuit.

The delayed-action device essentially comprises a capacitor C in series with a resistor R1 through which it may charge, the arrangement being connected between the terminals A and B of the delayed-action device (input terminal connected to the contact 14 and output terminal connected to the warning light 16).

A thyristor TH is connected in parallel with the series connected resistor R1 and capacitor C, the thyristor strictly speaking constituting a circuit for initiating the warning since, if the slide 12 connects the contact 14 to earth and if the thyristor is rendered conducting, the warning light 16 is connected to earth through the intermediary of the thyristor and may become illuminated. The function of the time lag circuit is to initiate conduction of the thyristor TH at the end of a predetermined time after the slide 12 has touched the contact 14.

The delayed-action device also comprises a Zener diode connected between the common point of the capacitor C and the resistor R1 and the gate of the thyristor TH. Also connected between the gate and the input terminal A is a gate leakage resistor R2. If the voltage at the terminals of the capacitor is less than the nominal voltage of the Zener diode, the latter remains blocked and virtually no current reaches the gate of the thyristor. If, on the contrary, the voltage of the capacitor is greater than the voltage of the Zener diode, the latter is rendered conducting and excites the gate of the thyristor TH which is thus initiated, i.e. rendered conductive.

Located between the terminals A and B of the delayed-action device and thus in parallel with the initiating thyristor TH is a resistor R3 the function of which is to allow the discharge of the capacitor C when the thyristor is not conducting and when the contact for detecting the minimum threshold of liquid is open. A diode D is located in parallel with the resistor R1 so that the discharge of the capacitor takes place through the diode D into the resistor R3 under the conditions which have been mentioned. The resistor R3 has an ohmic value which is substantially less than that of the resistor R1 in order that discharging takes place more quickly than charging and consequently that each opening of the contact between the slide 12 and the contact 14 discharges the capacitor C quickly and allows the delayed-action device to begin a new time lag as soon as the slide 12 once more touches the contact 14. However, the value of the resistor R3 should not be too low, since it is in series with the warning light 16 and the contact 14. Consequently, if the slide 12 touches the contact 14 and earths the latter, a current passes through the light 16 and the resistor R3 even if the thyristor is not conducting. It is necessary that this current is sufficiently limited so as not to cause any illumination of the light, illumination taking place solely from the time when the thyristor TH becomes conducting.

The device according to the invention operates in the following manner:

From an instant when the slide 12 touches the contact 14, the capacitor C charges through the resistor R1 and the warning light 16 which is connected to the battery.

When the voltage at the terminals of the capacitor exceeds the nominal voltage of the Zener diode Z, the thyristor becomes conducting. The light is illuminated and indicates to the driver the fact that his tank is inadequately filled. The duration of the time lag is chosen to be equal to several seconds or several dozen seconds as desired by a suitable choice of the resistor R1 and capacitor C. This duration should be sufficient to eliminate response to temporary earthing of the contact 14 for example when the liquid in the tank moves when the vehicle corners.

If contact is broken between the slide 12 and contact 14, the capacitor is discharged through D then the thyristor TH in parallel with the resistor R3. There is no longer any voltage at the gate of thyristor TH, but the thyristor nevertheless remains conducting as long as the current which passes through it is greater that its sustaining current.

If, on the contrary, before the end of the time lag, the slide 12 is no longer touching the contact 14, the thyristor TH not having been initiated since the voltage of the capacitor has not exceeded the voltage of the Zener diode Z, there is no illumination of the warning light. The capacitor C discharges fairly quickly through R3 in order to return the circuit to its initial state, unless the opening of the contact is extremely brief and recloses, in which case the capacitor C retains a certain charge and continues this charging through R1 until the thyristor TH is initiated.

CLAIMS

1. A delayed-action warning control circuit, in particular of a type intended to be connected in series with a warning device and a contact for detecting a threshold level of a liquid, characterised in that the control circuit comprises a capacitor connected in series with a resistor between two terminals, and control means responsive to the voltage across the capacitor to short circuit the said terminals in the event of the said voltage exceeding a predetermined value.

2. A delayed-action warning control circuit according to Claim 1, characterised in that a

discharge path is provided for the capacitor such that the capacitor discharges at a rate which is faster than the rate at which the capacitor is charged through said resistor.

3. A delayed-action warning control circuit according to Claim 2, characterised in that the discharge path comprises a diode connected in parallel with the resistor and a further resistor of a lower ohmic value than said resistor, the further resistor being connected between said terminals.

4. A delayed-action warning control circuit according to any one of Claims 1 to 3, characterised in that the control means comprise a thyristor connected between said terminals.

5. A delayed-action warning control circuit, according to Claim 4, characterised in that the control means also comprises a Zener diode connected between the common point of the capacitor and said resistor and the gate of the thyristor.

6. A delayed-action warning control circuit according to Claim 4 or 5, characterised in that a resistor is provided between the gate of the thyristor and one of said terminals.

7. A delayed-action warning control circuit substantially as hereinbefore described with reference to the accompanying drawing.

Printed for Her Majesty's Stationery Office
by Burgess & Son (Abingdon) Ltd.—1980.
Published at The Patent Office, 25 Southampton Buildings,
London, WC2A 1AY, from which copies may be obtained.